CLAIMS

What is claimed is:

1. (Currently Amended) A contactless sheet resistance measurement apparatus for measuring sheet resistance comprising:

   a light source for illuminating the area of a semiconductor structure with an intensity modulated light,

   a transparent conducting electrode optically coupled with the light source and used for detecting photovoltage signals inside the illuminated area,

   a first non transparent conducting electrode used for detecting photovoltage signals outside of the illumination area, and

   a second non transparent conducting electrode connected to a ground and installed between the transparent and first non transparent electrodes.

2. (Original) A contactless sheet resistance measurement apparatus for measuring the sheet resistance of claim 1, wherein said illumination means comprises a light emitting diode with a driver forming the sinusoidal illumination and an optical fiber directing the light onto the wafer surface.

3. (Cancelled) A contactless sheet resistance measurement apparatus for measuring the sheet resistance of claim 1, wherein said means for detecting of SPV signals comprises a transparent conducting electrode optically coupled with a light source used for detecting SPV signal inside the illumination area and a non transparent electrode used for detecting SPV signal outside the illumination area.

4. (Currently Amended) The apparatus of claim 1, wherein the transparent conducting electrode is a glass or quartz disk with an ITO coating and the first

non transparent electrode is a metal ring coaxially installed to the glass or quartz disk.

5. (Currently Amended) The apparatus of claim 1, wherein the transparent ~~and~~ conducting electrode is a glass or quartz disk with an ITO coating and the first non transparent electrode is a part of the metal ring coaxially installed to the glass or quartz disk.

6. (Cancelled) A contactless sheet resistance measurement method, comprising the steps of:

   illumination of the area of the semiconductor structure with known sheet resistance through a transparent electrode with intensity modulated light;

   measurement of the SPV signal from the transparent electrode;

   adjustment of the light flux to obtain linear dependence of the SPV signal versus light flux;

   measurement of SPV signals *Vs0*;

   measurement of SPV signal *Vs1* at the same conditions for wafer with unknown Rs; and

   determination of the sheet resistance using measured *RATIO=Vs1/Vs0*, and the calculated curve or table *RATIO(Rs)*.

7. (Cancelled) A contactless sheet resistance measurement method, comprising the steps of:

   illumination the area of the semiconductor structure through a transparent electrode with intensity modulated light at maximum frequency corresponding to bandwidth of SPV preamplifier and lock-in amplifier;

measurement of the SPV signal, *Vs1*, from the transparent electrode;

adjustment of the light flux to get linear dependence of the SPV signal, *Vs1*, versus light flux;

measurement of SPV signals, *Vs1* and *Vs2*;

adjustment of light modulating frequency to get the ratio of SPV signals $RATIO=Vs1/Vs2<5$ and measurement of *Vs1* an*Vs2* at this frequency; and

determination of the sheet resistance using measured $RATIO=Vs1/Vs2$, and the calculated curve or table *RATIO(Rs)*.

8. (Cancelled) A contactless method for measuring of sheet resistance and conductance of a p-n junction, comprising the steps of:

illumination the area of the semiconductor structure through a transparent electrode with intensity modulated light at maximum frequency, *F*, corresponding to a bandwidth of SPV preamplifier and lock-in amplifier;

measurement of the SPV signal, *Vs1*, from transparent electrode;

adjustment of the light flux to get linear dependence of the SPV signal, *Vs1*, versus light flux;

measurement of SPV signals and its phase shifts, $Vs1, \Theta1$ and $Vs2, \Theta2$ from transparent and non transparent electrodes;

decreasing of light modulating frequency to get the ratio of SPV signals $RATIO=Vs1/Vs2<5$ and measurement of $Vs1, \Theta1$ and $Vs2, \Theta2$ at this frequency; and

determination of the sheet resistance Rs and junction conductance Gs using measured SPV signals, its phase shifts, *Vs1, Θ1* and *Vs2, Θ2* and a set of equations:

$$\frac{Vs1}{Vs2} = \left|\frac{V_{S1}}{V_{S2}}\right| = \left|\frac{1}{2}kR_0^2 \; \frac{K_1(kR_0)I_0(kR_0) + K_0(kR_0)I_1(kR_0) - (1/2kR_0)K_1(kR_0)I_1(kR_0)}{I_1(kR_0)\left[R_1 \cdot K_1(kR_1) - R_2K_1(kR_2)\right]}\right| \quad (11)$$

$$\theta_1 - \theta_2 = Arg\left[\frac{1}{2}kR_0^2 \; \frac{K_1(kR_0)I_0(kR_0) + K_0(kR_0)I_1(kR_0) - (1/2kR_0)K_1(kR_0)I_1(kR_0)}{I_1(kR_0)\left[R_1 \cdot K_1(kR_1) - R_2K_1(kR_2)\right]}\right] \quad (12).$$

9. (New) The apparatus of claim 1, wherein the illumination means comprises a laser diode with a driver forming a sinusoidal illumination and an optical fiber directing the light onto the wafer surface.
10. (New) The apparatus of claim 1, wherein the means for detecting SPV signals includes a grounded metal ring coaxially installed to the disk between the disk and non transparent electrode metal ring.
11. (New) The apparatus of claim 4, wherein the first non transparent electrode is a metal arc coaxially installed to the glass disk.
12. (New) The apparatus of claim 4, wherein the second non transparent electrode connected to the ground is a metal ring coaxially installed between the glass or quartz disk with an ITO coating and the first non transparent electrode.
13. (New) The apparatus of claim 5, wherein the second non transparent electrode connected to the ground is a part of the metal ring coaxially installed between the glass or quartz disk with an ITO coating and the first non transparent electrode.

14. (New) The apparatus of claims 4, 5, 12, or 13 wherein the illumination means comprises a light emitting diode and an optical fiber directing light onto the wafer surface.

15. (New) The apparatus of claims 4, 5, 12, or 13, wherein the illumination means comprises a laser and an optical fiber directing light onto the wafer surface.